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(71)Applicant : NGK SPARK PLUG CO LTD

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(72)Inventor : NISHI MASAHIKO  
IWATANI MASAKI

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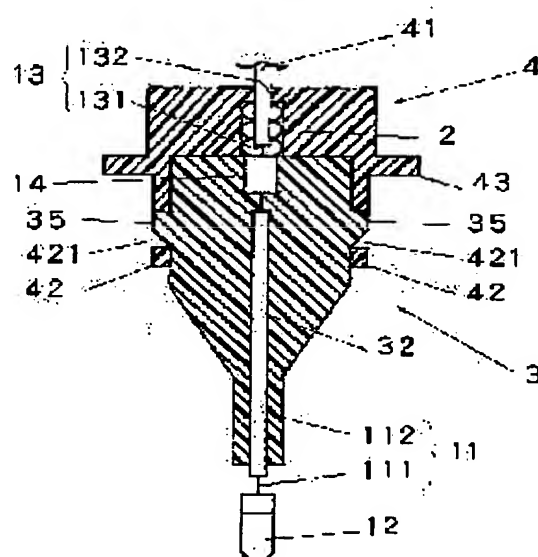
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## (54) WATERPROOF STRUCTURE FOR SENSOR AND SENSOR EQUIPPED WITH THE SAME

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide the waterproof structure of a sensor with sufficient waterproofness which can be easily formed and a sensor equipped with the waterproof structure.

**SOLUTION:** An element lead wire 11 and a connecting part 14 of the element lead wire 11 and a harness lead wire 13 are housed in a through-hole 32 formed inside a resin member 3, and the harness lead wire 13 is led from a leading hole 41 formed on the upper face of a resin molded body 4 fit to one edge side of the resin member 3. The resin member 3 and the resin molded body 4 are integrally fixed by fitting protrusions 35 for restraint formed at opposite two places on the side faces of the resin member 3 to notched parts 421 formed at pieces 42 for restraint formed so as to be extended to the lower parts of the resin molded body 4. Also, waterproof members 2 are fit 30 as to be relatively pressurized to the circumferential direction in a space formed of the resin member 3 and the resin molded body 4.



## LEGAL STATUS

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**CLAIMS**

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[Claim(s)]

[Claim 1] A resin Plastic solid and the resin member by which space was formed between these resin Plastic solids at the whole surface side, The lead wire arranged by penetrating said resin Plastic solid and said resin member so that an end might be opened outside and it might pass through this space, Waterproof construction of the sensor characterized by having the water proof member which prevents trespass of the moisture from said end side opened outside when stuck by the sensor component connected to the other end of this lead wire, and the wall surface and said lead wire of said space to said sensor component side.

[Claim 2] A resin Plastic solid and the resin member by which space was formed between these resin Plastic solids at the whole surface side, While an end is connected with the connector pin held in the connector terminal except a field formed in the side on the other hand and this connector terminal by the side of said resin member of said resin Plastic solid at this connector pin When said resin Plastic solid and said resin member are stuck by the lead wire arranged by penetrating, the sensor component connected to the other end of this lead wire, and the wall surface and said lead wire of said space so that it may pass through said space Waterproof construction of the sensor characterized by having the water proof member which prevents trespass of the moisture from said connector terminal side to said sensor component side.

[Claim 3] A sensor component and the lead wire by which the end was opened outside and this sensor component was connected to the other end, The resin member which has the resin member breakthrough in which this lead wire was arranged, and the resin Plastic solid which forms the space via which has the resin Plastic solid breakthrough in which this lead wire was arranged, and said lead wire goes with this resin member, The sensor characterized by having the water proof member which prevents trespass of the moisture from said end side opened outside when it was fitted in lead wire in this space and stuck by the wall surface and said lead wire of said space to said sensor component side.

[Claim 4] A sensor component and the connector pin which transmits the signal from this sensor component outside, The lead wire by which the end was connected to this connector pin and this sensor component was connected to the other end, The resin member which has the resin member breakthrough in which this lead wire was arranged, and the resin Plastic solid which forms the space via which has the resin Plastic solid breakthrough in which this lead wire was arranged, and said lead wire goes with this resin member, When it is formed in this resin Plastic solid and stuck by the connector terminal where said connector pin was held, and the wall surface and said lead wire of said space The sensor characterized by having the water proof member which prevents trespass of the moisture from said connector terminal side to said sensor component side.

[Claim 5] The above-mentioned resin member or the above-mentioned resin Plastic solid with which this water proof member is not arranged while the crevice for forming the above-mentioned space is formed in the above-mentioned resin Plastic solid or the above-mentioned resin member and the above-mentioned water proof member is arranged in this crevice is the sensor according to claim 3 or 4 by which it consisted of a Plastic solid of a half-segmented mold, the concave road established in each of a mating face was united, and the above-mentioned breakthrough was formed.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to a sensor equipped with the waterproof construction of a sensor, and it. The waterproof construction of the sensor of this invention is useful in various kinds of temperature sensors, such as a coolant temperature sensor arranged in predetermined parts, such as a car, an oil-temperature sensor, an intake temperature sensor, and an outside-air-temperature sensor, etc.

[0002]

[Description of the Prior Art] The component lead wire 11 which an insulating tube 112 is put on a metal wire 111, and becomes conventionally as shown in drawing 7, The sensor components 12, such as a thermistor connected to the end, and the harness lead wire 13 with which it comes to cover [ pre-insulation 132 ] the metal wire 131 connected to the other end or a connector terminal, since -- the sensor component 12 of the becoming sensor component member and its near are removed, and also various sensors are formed when the section builds into metal case 6 grade Plastic solid 5 laid under one if needed.

[0003]

[Problem(s) to be Solved by the Invention] However, moisture etc. may trespass upon the interior from the close relationship of the part where the adhesion of component lead wire and harness lead wire or a connector terminal, and hardening resin is not enough, and harness lead wire is pulled out from a Plastic solid, or the part as for which a connector terminal carries out opening to the end face of a Plastic solid. Moreover, production of a Plastic solid which has a sensor component member in one needs complicated processes of the casting into preparation of a resin raw material, degassing, and a mold, and a resin raw material, such as hardening and mold release, and its workability is low. Moreover, it is not easy to arrange a sensor component member in a position, either, and a sensor component may be damaged during an activity.

[0004] This invention solves the trouble of the above-mentioned conventional technique, and the specific resin Plastic solid and specific resin member of a configuration are used for it, and it aims at offering the waterproof construction of the sensor which prevents that it is transmitted to lead wire and moisture invades into a sensor component side by the water proof member arranged in the space formed of these. Moreover, it aims at offering the sensor by which trespass inside of moisture is prevented by removing the sensor component of a sensor component member, and its near inside the resin member beforehand formed in the predetermined configuration, and also arranging the section, and arranging a water proof member in the space further formed with this resin member and the resin Plastic solid of a specific configuration.

[0005]

[Means for Solving the Problem] The resin member by which, as for the waterproof construction of the sensor of the 1st invention, space was formed between these resin Plastic solids at the resin Plastic solid and whole surface side, The lead wire arranged by penetrating said resin Plastic solid and said resin member so that an end might be opened outside and it might pass through this space, When stuck by the sensor component connected to the other end of this lead wire, and the wall surface and said lead wire of said space, it is characterized by having the water proof member which prevents trespass of the moisture from said end side opened outside to said sensor component side.

[0006] The end of lead wire is connected to the connector pin except the resin member side of a resin Plastic solid which the connector terminal was formed in the side on the other hand, and was held in this connector terminal in the waterproof construction of the sensor of the 2nd invention. Other configurations are the same as that of the 1st invention.

[0007] A sensor component is arranged in the crevice for temperature measurement which is arranged in the

closed space where temperature etc. is measured, for example, is established in the cylinder crank case of a car etc. at the time of the activity of a sensor equipped with this waterproof construction. Moreover, like the intake temperature sensor of a car, when a metal case etc. is used, it is arranged in the closed space formed of this metal casing and above "resin member." It is desirable to fill up into this closed space with a temperature sensor the silicone compound which has heat-conducting characteristic, and to aim at improvement in the responsibility of a sensor. Moreover, when the sensor component member is not fully being held and fixed by the resin member etc., by making a closed space fill up with and harden thermosetting resin etc., a sensor component member can also be held and it can also fix.

[0008] The lead wire by which, as for the sensor of the 3rd invention, the sensor component and the end were opened outside, and this sensor component was connected to the other end, The resin member which has the resin member breakthrough in which this lead wire was arranged, and the resin Plastic solid which forms the space via which has the resin Plastic solid breakthrough in which this lead wire was arranged, and said lead wire goes with this resin member, When it is fitted in lead wire in this space and stuck by the wall surface and said lead wire of said space, it is characterized by having the water proof member which prevents trespass of the moisture from said end side opened outside to said sensor component side.

[0009] By the sensor of the 4th invention, a connector pin is held in the connector terminal formed in the resin Plastic solid, and the end of lead wire is connected to this connector pin. Other configurations are the same as that of the 3rd invention. In addition, the above "lead wire" in the 1st thru/or the 4th invention means both component lead wire and harness lead wire, and harness lead wire is stuck above "a water proof member" among these.

[0010] Especially the structure is not limited that a resin member should just be what can form component lead wire and the resin member breakthrough for containing the connection of lead wire if required in the interior. It is desirable to use the Plastic solid of the half-segmented mold with which the concave road for containing lead wire etc. was formed in each of a mating face like the 5th invention as this resin member. If it is a half-segmented mold, the resin member which has a breakthrough easily can be formed by doubling each field which has a concave road. Since it is sealed by the closed space whose temperature it is going to measure, or metal casing, for example in case a sensor is used for this resin member, it does not need to consider especially prevention of trespass, such as moisture from the outside. Therefore, even if it uses a half-segmented mold, it is completely satisfactory.

[0011] A resin Plastic solid should just be the configuration which can form the space which has a drawer hole for pulling out harness lead wire to the exterior, and can hold a water proof member between resin members. Moreover, since it is what is exposed to the open air etc. in case a sensor is used for this resin Plastic solid, it is desirable that it is what can prevent trespass of the moisture from the outside etc. certainly. Therefore, although a half-segmented mold etc. needs to apply and close adhesives etc. to a mating face in a resin Plastic solid which produces a gap in a shaping side and actuation and a process become complicated, the space which has sufficient waterproofness can be formed.

[0012] It is indispensable to prevent trespass of the moisture from this opening to a sensor component by the waterproof construction of the 1st invention to pull out and by which harness lead wire is pulled out from opening of a hole prepared in the resin Plastic solid, and the sensor of the 3rd invention. On the other hand, by the waterproof construction of the 2nd invention by which the connector terminal was formed in the resin Plastic solid, and the sensor of the 4th invention, trespass of moisture can also be more certainly prevented by using the external terminal which has waterproofness. Thus, it is useful to consider as a sensor equipped with the waterproof construction of the sensor of this invention and it especially in the sensor with lead wire by which harness lead wire was connected to the component lead wire of the 1st and 3rd invention, and a bigger operation and effectiveness are acquired.

[0013]

[Embodiment of the Invention] Hereafter, an example explains this invention in more detail.

Example 1 (example about the sensor with lead wire corresponding to the 3rd invention)

(1) Explain the process which manufactures a temperature sensor with lead wire using manufacture drawing 1 thru/or drawing 4 of a sensor.

\*\* Fit-in of the water proof member to a sensor component member (refer to drawing 1 )

The water proof member 2 made of rubber was fitted in the harness lead wire 13 of the sensor component member 1 which consists of the component lead wire 11, a temperature measurement component 12 which consists of a thermistor connected to the end of this component lead wire 11, and harness lead wire 13 connected to the other end.

[0014] Although construction material, especially a configuration, etc. are not limited, when the wire size of

weatherability, thermal resistance, and the harness lead wire 13, construction material, etc. are taken into consideration, it is [ that what is necessary is just what can prevent trespass of the moisture from the outside ] desirable [ this water proof member 2 is moderately flexible and ] to consider as the water proof member 2 which consists of silicone rubber or nitrile rubber.

[0015] \*\* Wearing of the sensor component member to the resin member of a half-segmented mold (refer to drawing 2 and drawing 3 )

The sensor component member prepared for concave road 312a for forming the breakthrough which contains the concave roads 311a and 311b for forming the breakthrough which contains the component lead wire 11 formed in each of both the internal surfaces 31a and 31b at the time of opening the resin member 3 of a half-segmented mold, and the connection 14 (refer to drawing 5 and drawing 6 ) of the component lead wire 11 and the harness lead wire 13, or each 312b\*\* by \*\* was inserted in. Then, the half-segmented mold was fixed to one with closing and the stop implements 33a, 33b, 33c, and 33d, and the medium article which has the appearance shown in drawing 3 was obtained.

[0016] This half-segmented type of resin member can be easily fabricated by the injection-molding method etc. using synthetic resin, such as a polyamide, polyester, and polyolefine, also including a concave road and a stop implement. A stop implement can be made into the configuration which can be stopped by inserting in one crevice and the heights of another side of the configuration corresponding to this. In addition, since the reinforcement of a resin member etc. is raised, requirements, for example, ten to 50 mass, % and the consolidation resin which blended the glass fiber of 20 - 40 mass % etc. especially can also be used.

[0017] \*\* Fit-in to the configuration and resin member of a resin Plastic solid (refer to drawing 3 and drawing 4 )

Resin Plastic solid 4 which has the shape of the lateral surface and isomorphism, the medial-surface configuration of this dimension, and a dimension was fitted in the side by which the harness lead wire 13 of the resin member 3 is pulled out. The drawer hole 41 (refer to drawing 5 and drawing 6 ) for pulling out the harness lead wire 13 is formed in the top face of this resin Plastic solid 4. Moreover, the piece 42 for a stop which has the notching section 421 is installed in the periphery lower part of resin Plastic solid 4, it is inserted in with the projection 35 for a stop formed in the side face of the resin member 3, and the resin member 3 and resin Plastic solid 4 are fixed to one. Furthermore, when equipping a metal case with a sensor, or when equipping with a sensor the crevice in which it was prepared by the cylinder crank case, the flange 43 to which wearing of the O ring for preventing trespass for sensor components, such as moisture, certainly becomes easy is formed in resin Plastic solid 4.

[0018] (2) Structure of a temperature sensor (refer to drawing 5 and drawing 6 )

The connection 14 of the component lead wire 11 and the component lead wire 11, and the harness lead wire 13 is contained by the breakthrough 32 formed in the interior of the resin member 3. Moreover, the harness lead wire 13 is pulled out from the drawer hole 41 formed in the top-face side of resin Plastic solid 4 fitted in the end side of the resin member 3. As it is indicated in drawing 6 as the resin member 3 and resin Plastic solid 4, the projection 35 for a stop formed in two places which the side face of the resin member 3 counters is being fixed to one by being inserted in the notching section 421 formed in the piece 42 for a stop which installed under resin Plastic solid 4 and was formed.

[0019] Furthermore, the water proof member 2 is fitted in the harness lead wire 13 in the space formed with the resin member 3 and resin Plastic solid 4. This space is formed in bore 4.4mmphi and a depth of about 7mm, and is pressed and stuck to the water proof member 2 in this space in the hoop direction. The thing which was formed in the top-face side of resin Plastic solid 4 of the water proof member 2 and by which it pulls out, the harness lead wire 13 is transmitted from a hole 41, and moisture invades into the temperature measurement component 12 is prevented certainly. In addition, since the diameter of free is 5.0mmphi, this water proof member 2 is pressed by the wall surface in space after having been crushed by the hoop direction 0.6mm.

[0020] In addition, in this invention, it is not restricted to the above-mentioned concrete example, but can consider as the example variously changed within the limits of this invention by the object, the application, etc. For example, the breakthrough formed in the interior of a resin member can also be made into larger space, and can also fix component lead wire by filling up this space with an epoxy resin etc. Moreover, it is desirable to be also able to use the half-segmented mold with which the resin member and the resin Plastic solid were united, to apply adhesives etc. to the mating face of the part equivalent to the resin Plastic solid of a half-segmented mold in this case, and to make waterproofness into a positive thing.

[0021]

[Effect of the Invention] According to the 1st thru/or the 2nd invention, it can consider as the waterproof

construction by which trespass of the moisture from the periphery of harness lead wire or a connector terminal is fully prevented. Moreover, according to the 3rd thru/or the 5th invention, it can consider as the sensor which can produce a sensor easily [ a process is simple and ] and by which trespass inside of moisture is prevented certainly.

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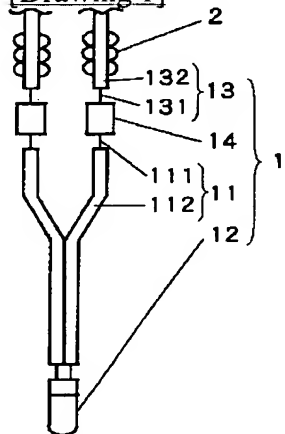
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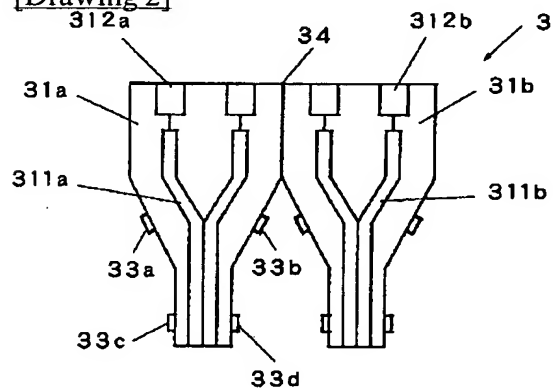
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## DRAWINGS

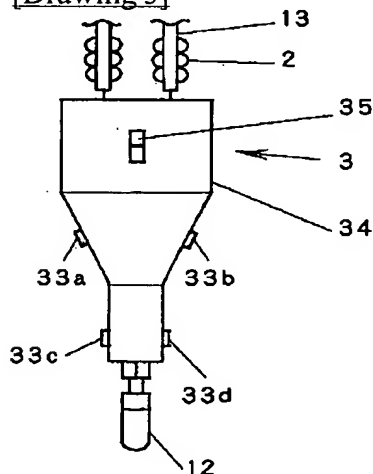
[Drawing 1]



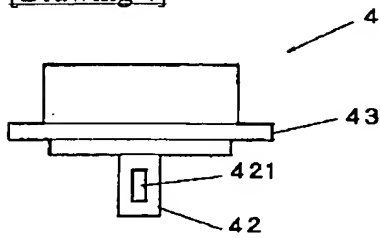
[Drawing 2]



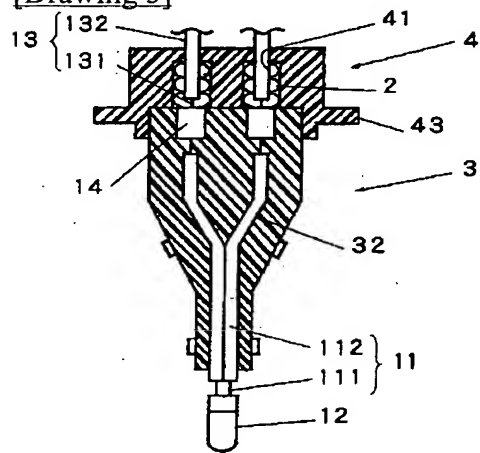
[Drawing 3]



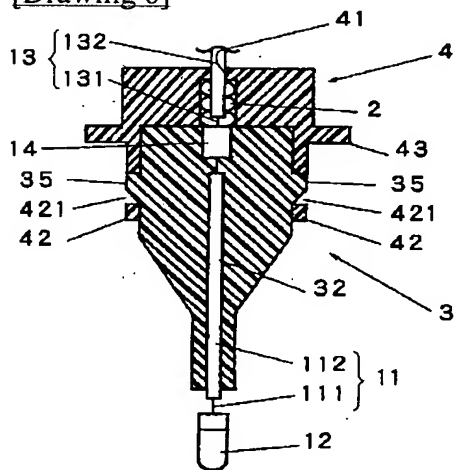
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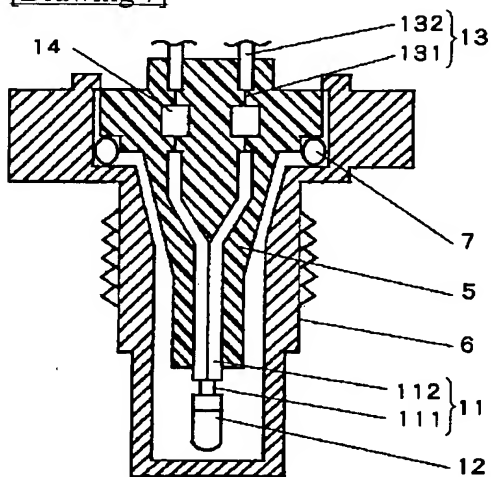
[Drawing 5]



[Drawing 6]



[Drawing 7]





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